



Foodborne Illness

Article by Athini Amarasiri.

What is a foodborne illness?

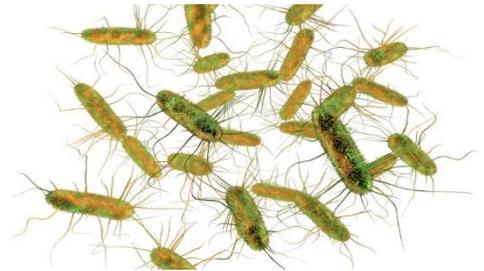
Foodborne illness is an illness caused by consuming contaminated food or drink. Contamination can occur at any stage of the food production, delivery, and consumption chain. Food contamination can result from pollution in water, soil, or air, as well as unsafe food processing and storage practices.

What are the causes of foodborne illness?

Most foodborne illnesses are infectious and caused by foodborne pathogens such as bacteria, viruses, parasites, and prions. Other foodborne diseases are essentially toxic in nature and caused by toxins or chemicals entering the body via contaminated food or water.

Bacteria

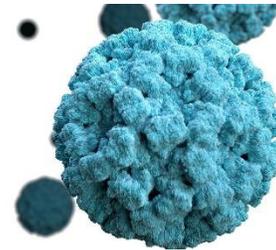
Bacteria is the most common cause of foodborne illnesses. Salmonella, Campylobacter, and Enterohaemorrhagic Escherichia coli are among most common foodborne pathogens which affect millions of people annually even with fatal outcomes. Clostridium perfringens, the "cafeteria germ", Listeria infection which leads to miscarriage in pregnant women or death of newborn babies, Vibrio cholerae which is responsible for cholera outbreaks are some of the other common bacterial foodborne pathogens.



Salmonella

Viruses

Viruses are responsible for one third of cases of food poisoning in developed countries. Norovirus is the most common viral infection. Hepatitis A virus can cause long-lasting liver disease and spreads through raw or undercooked seafood or contaminated raw produce. Enterovirus, Rotavirus, Hepatitis E are also common viral foodborne pathogens. Infected food handlers are the main source of food contamination for these viral infections.



Norovirus

Parasites

Most foodborne parasites are zoonoses (transmitted from the animals to human). Some parasites, such as fish-borne trematodes, are only transmitted through food. Some may infect people through food or direct contact with animals (e.g. Tapeworms).



Giardia

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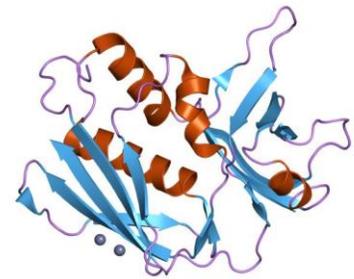
Other parasites, such as *Ascaris*, *Cryptosporidium*, *Entamoeba histolytica* enter the food chain via water or soil and can contaminate fresh produce.

Prions

Prions are the infectious agents composed of protein. The prion responsible for the “mad cow disease” in cattle, associated with the Creutzfeldt-Jakob Disease (CJD) and its variant (vCJD) in humans. Consuming bovine products containing risk material is the most likely route of transmission of the prion agent to humans.

Enterotoxins

Some foodborne illnesses are caused by enterotoxins (exotoxins targeting the intestines) which are produced by certain bacterial species. Staphylococcal enterotoxin A and staphylococcal enterotoxin B are the most reported enterotoxins causing foodborne illnesses. These enterotoxins are mainly occurred in cooked and processed food and food handlers remains the main source of contamination as they act as the carriers of *Staphylococcus aureus*.



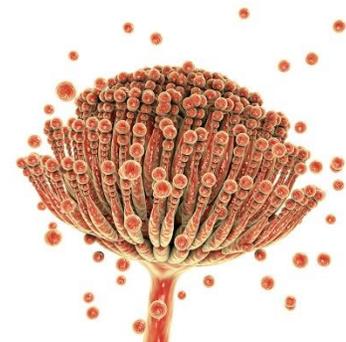
Staphylococcal Enterotoxin B

Botulin is a powerful paralytic toxin produced by *Clostridium botulinum*, causing rare but deadly disease botulism. Improperly canned low acid foods can cause this illness as it allows the bacteria to grow.

Natural toxins

Mycotoxins, marine biotoxins, cyanogenic glycosides and toxins occurring in poisonous mushrooms are considered as the naturally occurring toxins.

High levels of mycotoxins can be found in staple foods like corn or cereals. Mycotoxins such as Aflatoxin or Ochratoxins are produced by mould on grain. A long-term exposure to these substances can affect the immune system and normal development, or cause cancer.



Mycotoxin

Aflatoxin is the most common mycotoxin and frequently found in tree nuts, peanuts, maize, sorghum, and other oilseeds, including corn and cottonseeds.

Ciguatera poisoning, paralytic shellfish poisoning, scombrototoxin poisoning are some of the foodborne illnesses related with fish and shellfish.

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Environmental pollutants

The environmental pollutants are the compounds accumulated in the environment such as persistent organic pollutants (POPs) and heavy metals.

Dioxins and polychlorinated biphenyls (PCBs) are known POPs which are by-products of industrial processes and waste incineration. Dioxins are highly toxic and can cause reproductive and developmental problems, damage the immune system, interfere with hormones, and cause cancer.

Heavy metals such as lead, cadmium and mercury cause neurological and kidney damage. Contamination by heavy metal in food occurs mainly through pollution of air, water, and soil. Mercury in fish is a matter of concern across Australia; FSANZ has established the limits to the normal population (2-3 serves per week of any fish or seafood), pregnant women and children under 6 years.

Effect of foodborne illnesses

- Food borne illnesses can range from diarrhea to cancers
- Foodborne pathogens enter the body through the gastrointestinal tract causing common gastro symptoms such as nausea, vomiting, abdominal cramps, and diarrhea
- Some foodborne pathogens can also be a cause to serious illnesses such as meningitis
- The main symptom of a foodborne illnesses is gastrointestinal, but can also be neurological, gynaecological, or immunological symptoms
- Chemical contamination can lead to acute poisoning on ingestion or long-term diseases, such as cancer
- Foodborne diseases may lead to long-lasting disability and death

Foodborne illnesses as a global public health issue

- More than 200 known foodborne illnesses are caused by contaminated food
- An estimated 600 million (almost 1 in 10 people) in the world fall ill after eating contaminated food annually
- 420 000 die every year, resulting in the loss of 33 million healthy life years
- Children under 5 years of age carry 40% of the foodborne disease burden, with 125 000 deaths every year
- Diarrhea is the most common foodborne illness caused by contaminated food, causing 550 million people to fall ill and 230 000 deaths every year
- Unsafe food creates a vicious cycle of disease and malnutrition, affecting infants, young children, elderly and the sick
- This growing public health issue causes considerable socioeconomic impact by adding pressure on health care systems, harming national economies, tourism, and trade across the world. US\$110 billion is lost each year in productivity and medical expenses resulting from unsafe food in low- and middle-income countries

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Foodborne illnesses in Australia

Food Standards Australia New Zealand, the NSW Food Authority, and the Australian Department of Health funded study by the Australian National University (2014) revealed, estimated 4.1 million cases of foodborne gastroenteritis acquired in Australia on average each year along with 5,140 cases of non-gastrointestinal illness.

Most of the gastroenteritis that occur in Australia are estimated to be transmitted by contaminated food. This study revealed food-borne illness in Australia every year results in:

- 18,000 hospitalizations
- 120 deaths (0.5 deaths per 100,000 inhabitants)
- 2.1 million lost days off work
- 1.2 million doctor consultations
- 300,000 prescriptions for antibiotics

Most foodborne disease outbreaks in Australia have been linked to raw or minimally cooked eggs or poultry.

Antibiotic resistance has become an emerging challenge in medical industry.

The Australian Food Safety Information Council estimates that one third of cases of food poisoning occur in the home. According to the study, there are four main causes for foodborne illnesses in Australia:

- Norovirus
- Pathogenic Escherichia coli
- Campylobacter spp.
- Non-typhoidal Salmonella spp.

Norovirus

- Infections are commonly known as winter vomiting, stomach flu, gastric flu, and viral gastro
- Most common type of virus cause gastroenteritis
- Main symptoms are vomiting, nausea, diarrhea, cramp-like stomach pain, low-grade fever
- Symptoms appear 1-2 days after ingestion and last for 1-2 days if infected to a healthy person
- Symptoms are severe and long lasting in elderly, young children, and people with compromised immunity system
- Highly contagious, spreads from an infected person when someone has contact with the infected person's vomit or faeces, by touching contaminated hands, surfaces, or objects, by food or water that they have contaminated

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Pathogenic *Escherichia coli*

- *E. coli* are a group of bacteria which are found in the gut of nearly all people and animals
- Illness typically caused by consumption of contaminated food (ground beef, raw milk, fresh green vegetables), water, swimming water, from toddler to toddler at a day care centre
- The illness can cause a severe and bloody diarrhea, painful abdominal cramps, nausea, vomiting, which can last 5-10 days
- Urinary infections, pneumonia, meningitis in newborns are also caused by *E. coli*
- In 3 to 5% of cases, a life-threatening complication called the haemolytic uremic syndrome (HUS) can occur several weeks after the initial symptoms, resulting anaemia, profuse bleeding, and kidney failure

Campylobacter spp.

- *Campylobacter* is the most common cause of food poisoning in Australia
- More than 3,200 hospitalisations occur because of foodborne illnesses caused by *Campylobacter*
- Cross contamination is the main cause of spread of the bacteria
- This bacterium causes gastroenteritis, commonly known as gastro
- Main symptoms are diarrhoea, abdominal pains, cramps, fever, symptoms appear 2-5 days after ingestion and can last for 1-3 weeks
- Young children under 5 years, elderly and people with compromised immunity system are at high risk of infection
- *Campylobacter* outbreaks are related with the contaminated raw milk, raw or undercooked poultry and drinking water

Non-typhoidal *Salmonella* spp.

- *Salmonella* is the second most common cause of foodborne illnesses in Australia
- Salmonellosis cases has been significantly increasing over past 20 years compared to similar countries
- 56,000 hospitalisations, 15 deaths have been reported because of foodborne illnesses caused by *Salmonella* according to the annual incident circa 2010
- This bacterium causes gastroenteritis, commonly known as gastro
- Main symptoms are headache, fever, stomach cramps, diarrhea, nausea and vomiting, symptoms last for days or weeks
- Pregnant women, young children under 5 years, elderly over 60 years and people with compromised immunity system are at high risk of infection
- *Salmonella* outbreaks are related with the contaminated eggs, poultry, and other animal products

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References

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